

REMARKS

Claims 1, 3, 7-9, 15, 19 and 26 remain pending in this application.

Claims 1, 3, 7-9, 15, 19, and 26 remain rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over:

U.S. Patent Application No. 5,863,493 (Achari et al.) ("the '493 patent") in view of 5,538,686 (Chen et al.) ("the '686 patent").

Applicants traverse these Section 103 rejections.

As the Examiner is aware to establish a *prima facie* case of obviousness under Section 103, there must be some reason, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the references or to combine reference teachings. KSR International Co. v. Teleflex Inc., 127 S. Ct. 1727, 1741 (2007). Moreover, the cited documents must disclose, teach or suggest all of the recitations of the claims under review. If more than one document is combined together to form a reception under Section 103, which is the case here, the reason to make the claimed combination, and a reasonable expectation of success, must be found elsewhere than in Applicants' disclosure, such as in the cited documents of record, the nature of the problem to be solved, or in the knowledge/understanding of the

person of ordinary skill in the art. MPEP § 2143; In re Vaeck, 947 F.2d 488 (Fed. Cir. 1991). The instant Section 103 rejections do not meet these requirements.

The '493 patent, cited as a primary reference, is directed to and claims an electrical solder composition consisting essentially of between 91.5-96.5% Sn; 2-5% Ag; 0-2% Cu; and 0.1-2% Ni and having a melting temperature 220°C or less.

Absent from the '493 patent as required components are Sb and Bi, appearing to be optional at concentrations of up to 1%, and Cu too is only mentioned as an optional element. Indeed, in the Action at page 2, the Examiner recognizes this failing (... "Achari [the '493 patent] does not teach a lead free composition comprising bismuth or antimony.").

The very next line in the Action at page 2 refers to Chen (or, the '686 patent) to try to fill the gap in disclosure presented by the '493 patent as a reference for citation under Section 103.

The '686 patent is directed to an article comprising a solder composition, the solder composition comprising an alloy having at least approximately 70 percent tin, approximately 6-10 weight percent zinc, approximately 3-10 weight percent indium, and an effective amount of bismuth not greater than

approximately 10 weight percent to reduce the tendency for the formation of lower temperature phases. Sb is mentioned as a possible alternative additional element. Thus, distilled to its essence, the '686 patent discloses a Sn-Zn-In alloy, with Bi and/or possibly Sb.

In contrast, the inventive lead free soldering material as defined for instance with reference to Claim 1 includes the combination of six elements, which in combination improves temperature cycling and improves hardening.

Two different types of alloys are disclosed in the '493 patent and the '686 patent. Applicants previously presented arguments and data to highlight this fact. However, the Examiner has pointed out in the Action at page 3 that the tables presented in Applicants' previous paper were not presented in a 132 declaration and thus were "not considered relevant in the arguments." Applicants disagree.

Nonetheless, taking the Examiner up on the invitation to submit a 132 declaration, Applicants have done so. Accordingly, submitted herewith is the Declaration Under 37 C.F.R. § 1.132 of Malcolm E. Warwick ("the Warwick Declaration").

In his declaration, Dr. Warwick establishes his credentials to speak to the issues presented in the prosecution

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of this application. (Warwick Declaration, ¶¶ 1-5.) Dr. Warwick then goes on to present information germane to the subject application using similar data as previously submitted, though in slightly different format. This data is available to the public in the Final Report of the BMBF Consortium Project entitled "Innolot" from 2004, of which project Dr. Warwick was involved.

Given the '493 patent, Dr. Warwick concludes one of ordinary skill in the art would not look to a SnZnIn alloy (such as disclosed in the '686 patent) to remedy the shortcomings of the solder alloy disclosed in the '493 patent because that alloy contains different metallurgy. (Warwick Declaration, ¶ 22.)

Looking to the '686 patent to supply the missing elements of the Examiner's obviousness formula, ignores salient and required teachings of '686 patent -- i.e., the presence of Zn, and more particularly at a significant level (6-10 weight percent).

The '686 patent refers to the addition of Sb and/or Bi to a SnZnIn solder alloy to reduce the tendency of low melting temperature phases to form. Dr. Warwick points out in his declaration that in practice, the addition of Bi to the SAC alloy introduces low melting phases. (Warwick Declaration, ¶ 16.) Solders based on SnZnIn have a different metallurgy than

Sn-Ag-Cu solders, and there is no reason to expect that based on the '493 patent the addition of Bi and Sb would have the same result.

And Dr. Warwick explains that an alloy formed from Sn, Zn and In will show solid solution hardening in the Sn phase because both Zn and In have significant solid solubility in Sn (2.5% and 12% at the eutectic temperature). The Zn that does not go into solid solution forms a coarse Zn eutectic phase. (Warwick Declaration, ¶ 15.) Dr. Warwick thus concludes that the '686 patent does not disclose, teach or suggest anything about the influence of added Bi and Sb on the SAC alloy. Id.

In the Warwick Declaration, Dr. Warwick indicates that the '493 patent, cited as the primary reference against the pending claims, reports Sn-Ni, Sn-Cu, and Sn-Cu-Ni alloys have a uniformly dispersed microstructure leading to intermetallic formation. Such intermetallic formation is reported to increase resistance to temperature cycling. Interestingly, Dr. Warwick notes no creep, fatigue or even tensile or shear strength measurements are reported in the '493 patent. (Warwick Declaration, ¶ 9.)

Dr. Warwick then points out that during the BMBF Consortium Project entitled "Innolot" it was determined that the addition of Ni did not increase resistance to temperature

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cycling in a SnAg3.8Cu0.7 alloy (referred to herein as "the SAC alloy"). (Warwick Declaration, ¶ 10.) Indeed, Dr. Warwick notes in his declaration that at two amounts within the range recited in the '493 patent, as measured by creep performance, temperature resistance actually decreased in the SAC alloy. (Warwick Declaration, ¶¶ 10-12.)

As a result, Dr. Warwick points out in his declaration, that in his view because of the decrease in creep resistance shown by the SnAgCuNi alloy of the '493 patent, one of ordinary skill in the art would not have chosen such a SnAgCuNi alloy as a starting place. (Warwick Declaration, ¶ 13.) And indeed Applicants did not.

Instead, Applicants -- and only Applicants -- chose a solder alloy defined as one including Sn (tin), 10 wt.% or less Ag (silver), 10 wt.% or less Bi (bismuth), 1 to 3 wt.% Sb (antimony), 0.5 to 3 wt.% Cu (copper), and 1.0 wt.% or less Ni (nickel) to achieve the desired benefits, such as improving creep resistance.

In sum, neither the '493 patent nor the '686 patent, individually or in combination, impacts adversely the claims as presently presented in the subject patent application.

The '493 patent proposes a Sn-Ag-Cu alloy with the addition of Ni that is inferior in mechanical properties to the

base Sn-Ag-Cu alloy. The '686 patent uses a completely different base alloy system, Sn-Zn-In, where the claimed benefit of Bi addition is for the opposite effect of the Bi addition to the Sn-Ag-Cu alloy.

The Warwick Declaration clearly illustrates the error in the Examiner's determination regarding the "expect[ation] that the additions of the metals would have the same effect on the solders even when comprising a small amount of different metals" and regarding the existence of "motivation to include Bi and Sb as taught by [the] '686 [patent] in the solder as taught by [the] '493 [patent]".

Based on the above, favorable reconsideration and consideration as the case may be is respectfully requested.

Applicants have reviewed the remaining documents cited on page 4 of the Action, but not relied upon, and do not see that any impact adversely the patentability of the pending claims.

Accordingly, in view of these amendments and remarks, Applicants respectfully submit that all rejections have been addressed, and they should no longer be maintained. Applicants further submit that the application is in condition for allowance, and respectfully request such an indication in the next written communication.

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To the extent that the Examiner does not believe that the present paper places the application in condition for allowance, he is respectfully requested to contact Applicants' undersigned attorney may be reached by telephone at (860) 571-5001, by facsimile at (860) 571-5028 or by e-mail at steve.bauman@us.henkel.com. All correspondence should be directed to the address given below.

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